wood, and left to steep in water about four hours; after which they are to be placed in a heap together in a hollow place, and covered with straw. They are to be left thus for eight or ten days: a little water is to be sprinkled over them every day, and after this the green rind comes off easily. They are then to be beaten with a mallet on a stone, and then untied and spread to dry, after which the material may be dressed in the same manner as flax.

"The green twigs of broom, are good food for sheep; and the flowers afford excellent nourishment for bees; sheep should not be let to feed on the broom, until it is three years old; and it should be pruned after the sheep have eaten off the twigs. It thrives best on a sandy or stony soil."

Some circumstances in the paper from the Philosophical Magazine, give reasons to suppose that the author of it is Sir James Hall.

Report on a method employed to destroy the smoak of a steam engine, at the Mint in Paris; by M. Guyton de Morveau, and M. de Prony. Annales de Chemie.

The boiler of this steam engine, is of a cylindrical shape, headed by a hemisphere. The plan of the fire place is of course a circle; and the grate is a square inscribed in the circle. The door by which fuel is introduced, at the extremity of one of the diameters of the fire place, answers to an opening placed at the other extremity of the same diameter, by which the flame escapes to circulate round the boiler, following a channel made in the brick work round the sides. This channel terminates, after an entire revolution, in a chimney communicating with the external air.

Two other channels made in the brick work, which are always open, are on the two sides of the door of the fire place, and make each of them half a revolution, in opposite directions, below the channel of circulation that envelopes the boiler, in order that they may open on the two sides of that opening of the fire place, by which the flame enters into the channel that causes it to circulate round the boiler.

From this construction the two currents of air, introduced by the two channels just described, as soon as the door of the fire place is closed, unite into a single one, which rushes along with the flame into the channel of circulation. The vapourized part of the fuel, which is not yet consumed, and would produce the smoke, preserving by these means a temperature sufficiently high to separate the principles of the atmosphere and to unite with the oxygen, is burned before it arrives at the chimney, which only receives transparent gases. The caloric disengaged by the combustion of the smoke, contributes to the heating of the boiler.

These effects take place during the whole of the time, that the door of the fire place is shut, but as soon as it is opened, to introduce fresh fuel under the boiler, the combustion of the smoke immediately ceases. But it will be very easy to avoid this inconvenience in future by constructing the furnaces after the manner of those called athanors, in which the fuel is introduced and renewed by means of a *slow harry*, so that the fire place is constantly closed.

After this account of the furnace which consumes its smoke, Messrs. Morveau and Prony trace back the first invention on the subject to M. Dalesme (the author of many ingenious discoveries described in the volumes of the Academy of Sciences) who before the year 1669, made a fire place that burned its smoke, by constructing it in the shorter leg of a reversed syphen, which caused the flame to be drawn downwards through the grate and burning fuel. Delaitre also made some experiments on the subject, and inserted a note on the process of Dalesme in the volume of the academy for the abovementioned year. Both their methods are described in Boerhaave's chemistry, and were usefully employed in the 17th century, in several manufactories.

The authors then recount the theory of combustion, on which the following chief conditions for consuming smoke principally depend.

1. Such a disposition of the fire place, that a current of air may be established, flowing through the door, or some opening into the chimney.

2. The flowing of a mass of air upon the fuel in a proper proportion to its quantity, in such a manner that the fuel shall find in the air which comes in contact with it, such a quantity of oxygen, that all the molecules of the fuel, which are capable of being combined with that part of the air, shall unite with it.

3. A sufficient elevation of the temperature at the place of contact of the air with the fuel, to cause the decomposition of the air.

For the second condition, experience shows, that a much greater quantity of air is necessary, than what contains the exact portion of oxygen strictly required by the combustion, supposing that this oxygen was pure, or previously separated from the azote.

Argand lamps offer an application of these principles, which is as curious as it is useful. The rack which allows the wick to be lengthened or shortened, furnishes the means of always proportioning the mass of the burning body to that of the air, which passes through and surrounds the flame. This proportion is so indispensible, that as soon as it is altered, by uncovering too much of the wick, smoke is immediately produced. A manufacturer of these lamps, in order to increase the light, by procuring means of uncovering more of the wick, without producing smoke, made several small holes in the glass chimney immediately above the groove in which it is placed, and by thus augmenting the quantity of air to be decomposed, he is able to increase proportionally the surface of the wick impregnated with the fuel.

The principles here explained ought naturally to lead to the idea of directing similar currents of air, upon the flame of furnaces, by particular channels, never to be stopped, in order to compensate the insufficiency of the air, that passes through the grate where it is frequently stopped by the slags; another disposition, still more analagous to those lamps, consists in causing the smoke to pass through a narrow throat, which from its small surface and the heat of its sides, would not lower its temperature in any sensible degree, and to which place a continued current of air not disoxigenised, may be brought by means of other tubes, or channels. Thus the two conditions necessary for combustion, namely oxygen, and a certain degree of temperature, would be united in the current of smoke; and the combustible materials, which are suspended in this smoke, would of course be burned.

The authors mention that furnaces which burn their smoke, were used seven or eight years ago by Messrs. Clement and Desormes, in a manufacture of green vitriol at Paris, near de la Garre, and at their alum works at Verberie. M. Champy, junior, has also used them at the gunpowder works at Essone, and M. Montgolfier, assisted these gentlemen by his advice in the construction of these furnaces. M. Gemgembre, who constructed the furnace described at the mint, received his knowledge on the subject, by inspecting the labours of Messrs. Clement, Desormes, and Champy: who have all declared that they did not know of the inventions of Messrs. Robertson, or Mr. Watt of Britain.

In 1801, Messrs. Robertson of Glasgow, took out a patent for smoke-destroying furnaces. Their process consisted in introducing immediately over the fire place, a plate of external air, the thickness of which may be altered by means of a very simple mechanism, which regulates the distances of two inclined plates of iron, between which this plate of air passes. The space between those iron plates, communicates with the atmosphere by a horizontal opening made above the door, and against which the plates are placed.

The authors add, that it was known by hearsay that Mr. Watt, had long before the date of Messrs. Robertson's patent, occupied himself on the means of burning the smoke from steam engines, but they do not believe that he has published his inventions on that head, and assert that they should not have had any idea of his method of destroying the smoke, if

it had not been for a steam engine, constructed at Soho on his plan, which was brought over to Nantes, and erected there in 1796, under the direction of M. Leveque. The principal point in which the method of burning the smoke used in this engine, differs from that of Messrs. Robertson is, that in it the current of air is introduced under the grate, instead of above it, as in Robertson's engine: the first apparatus acts therefore with a direct flame, and the second with a reversed flame.

Remarks....The authors of this paper are entirely erroneous in their insinuation that Mr. Watt's method of constructing furnaces to burn smoke, had not been published at the time when Clements and Desormes erected their works. Mr. Watt took out his patent for furnaces which consume their smoke, in June 1785; and as the specifications of all patents are open to the public inspection at the patent office, this may be esteemed the date of the first publication of the contrivance. Besides this the specification of this patent of Mr. Watt's was published at large in the Repertory of Arts, vol. 4, p. 226, in the year 1796, a work generally known; and of which there are evident proofs that it had long since found its way to Paris, in the copious extracts which are made from it in the French periodical works, particularly in the Annales des Arts, and the Bibliothoque Britanique.

Both Mr. Watt's furnace, and Mr. Robertson's were furnished with the *slow harrys*, which the French gentlemen propose as a *new* improvement to those of this description. On this occasion there are strong symptoms of their having suffered their *Nationalite* to get the better of their candour, in their endeavours to confer the honour of the invention on their own countreymen.

Besides the gentlemen mentioned, Mr. W. Thompson of Bow lane, London, published in 1796, an account of a furnace contrived by him for the same purpose, which may be seen in the same 4th volume of the above-mentioned work.

The great use which inventions for making furnaces burn their smoke are of, will be better illustrated by the following expressions of Count Rumford, than by any thing we could state on the occasion.

"The enormous waste of fuel in London may be estimated by the vast dark cloud which continually hangs over that great metropolis, and frequently overshadows the whole country far and wide; for this dense cloud is certainly composed almost entirely of *unconsumed coal*, which having taken wings from the innumerable fires of this great city has escaped by the chimnies, and continues to sail about in the air, till having lost the heat which gave it volatility it falls in a dry shower of extremely fine black dust to the ground, obscuring the atmosphere in its descent and frequently changing the brightest day into more than Egyptian darkness.

"I never view from a distance, as I come into town, this black cloud which hangs over London without wishing to be able to compute the immense number of chaldrons of coals, of which it is composed; for could this be ascertained, I am persuaded so striking a fact would awaken the curiosity, and excite the astonishment of all ranks of the inhabitants; and perhaps turn their minds to an object of economy to which they have hitherto paid little attention."

What Count Rumford observes here of London is proportionally true of all towns where coal is burned. In some large manufactories, and breweries the vast volumes of smoke produced are a public nuisance, to their vicinity; and when the means are now so well ascertained by which this evil might be obviated, there can be little doubt that on proper legal application, the owners of such works might be compelled to have the furnaces made so as to consume their smoke. A strong instance of this nature occurs at the near end of Oxford road, London, where the prodigious volumes of smoke that comes from a brewery, frequently involves the neighbouring streets, for half a furlong round, in such a dense cloud as to be extremely offensive to most of the senses of the passengers; what then must be the inconvenience, of those who live near it?

The method of burning the smoke at the mint at Paris above described, seems considerably easier of execution than any before published, and on that account is well worth notice.

*On the use of Stahl's alkalized oxide of Iron, in Calico printing, by J. M. Hausman.**

M. Hausman makes great use of this dye in the preparation of printed calicoes; he endeavours to overload it with oxide of iron. In order to guard against precipitation, and to easily suspend the solution, he ties up the metal that is to be dissolved into a bundle, that he may take it out at pleasure whe the nitrous acid is ready to flow over. For by employing this precaution when the bundle is taken out (after the effervescence, which produces a great heat, has sufficiently subsided) while an excess of acid remains, which is certainly necessary, a pigment will be obtained without any deposit.

If a sufficient quantity of fluid, consisting of three parts of calcined carbonate of potash of the shops, and of two parts of water, be poured into the nitrous solution of iron, there will, on stirring the mass (by which means it effervesces a little) be formed a magma; to which as much liquid carbonate of potash must be added as is necessary for its complete solution. This solution of iron gives, with a fifth or sixth part of gum water (prepared from equal parts of gum Arabic and water, and then thickened) ochery yellow colours which can be easily purified. The addition of a twelfth part of a decoction of yellow berries, with a twenty fourth part of a decoction of logwood, gives the tint known by the name of American colour: and a twelfth part of a décoction of logwood, without yellow berries gives a chocolate colour.

If this dye be diluted with a sufficient quantity of water, all the oxide falls to the bottom. When edulcorated filtered, and brought to a white heat in a crucible, this oxide polishes steel as completely as the English colcothar.

Linen or worsted yarn impregnated with this dye, and then immersed in a dye liquor prepared with caustic alkali, which precipitates the oxide of iron, acquires by this process a much darker yellow, than when it is left at rest for twenty four hours, and then dried, and washed.

Every drop of a solution of caustic alkali applied to this dye, precipitates from it a part of the oxide as it overcomes the carbonic acid. By these means it is completely decomposed; and this oxide, when washed, and exposed to heat for a sufficient time, gives a very fine polish too.

This dye is nothing else but a solution of hyperoxigenated carbonate of iron, by an alkaline carbonate which serves it as a vehicle; only care must be taken not to add too much when dark colours are required.

All solutions of iron sufficiently oxigenated, treated with an alkaline carbonate, in the same manner as the nitrous solution of iron, are capable of producing a similar dye.

A nitrous solution of copper, prepared from nine pounds of green oxide of copper, nine pounds of water, and three pounds of cream of tartar, with a solution of carbonate of potash, and treated as the nitrous solution of iron produces similar effects. When mixed with gum, and imprinted on woollen or cotton stuffs, it deposits the oxide of copper of a beautiful green tint. A gummed amoniacal solution of copper may be employed in its stead; for when the cloth is dried the ammonia is disengaged from it, and the green oxide remains united with it in consequence of its cohesion.

If linen or woollen yarn be soaked in nitrous or any other hyperoxigenated solution of iron, diluted with more or less water, and then be exposed for some minutes to a caustic alkaline ley, a beautiful nankeen colour will be produced. Instead of the nitrous solution, one more or less diluted of sulphuric acid may be employed. Many articles when taken from the caustic ley are dirty, but when they have attracted the oxigen of the atmosphere, they acquire the proper brightness. These colours pass to violet and black by maddering. They will acquire a deep black colour, as

* Inserted by particular request, from Phil. Mag. v.17 p.323.